Herpetofaunal Surveys of National Park Service Sites in Western Nebraska, Eastern Wyoming, Western South Dakota, and Western North Dakota: Interim Report, 2002 – 2003 Field Work

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Abstract: Surveys of seven national park units were conducted in western Nebraska, eastern Wyoming, western South Dakota, and western North Dakota in 2002 and 2003. The primary objective was to document at least 90% of the herpetofauna that occurred on each park unit. This study did not meet that objective, since we encountered from 27.3 – 64.3% of the species we expected to find on each park unit. Possible reasons for this result were that some survey types were not used (such as drift fences), severe drought affected the area in 2002 and its aftereffects were still felt in 2003, and time and resources were lacking. It is also possible that the numbers of species of herpetofauna expected on each park will decline when detailed reports are compiled in which habitat is taken into consideration. Suitable habitat for several species did not exist on many of the park units under investigation, although these species are listed as occurring on the park unit since the unit is within the range of the species. In addition, the small

park units we concentrated on in this study are sometimes surrounded by unsuitable habitat, so immigration of populations onto the park may be severely restricted.

The secondary objective was to assess various survey techniques used in the study, including visual encounter surveys, nighttime call surveys, night driving and trail searches, and nighttime searches of prairie dog burrows. Drift fences were not used. The most successful technique was nighttime call surveys, but this survey type was biased towards the observation of only one or a few species of amphibians. Nighttime searches of prairie dog holes were somewhat successful in finding some species, but this survey type was also biased towards finding only a few species of reptiles and amphibians. Visual encounter surveys were the only other successful survey type we used, but in general the success rate of this survey type was very low. However, visual encounter surveys were more successful when conducted in suitable habitat (such as near water sources) than if they were conducted at random localities.

We also make some management recommendations. In the largely arid region we investigated, reptiles and amphibians are often concentrated around water sources. Park resource managers should concentrate on improving water resources where possible, especially smaller (<1 ha) ponds without introduced predatory fish. This pond type is ideal for reproduction for a variety of species of toads and frogs, and they are a critical component of the food web for a variety of vertebrates, including reptiles. Snake dens should also be carefully monitored if they are known to exist on park units, since they are critical habitat for snakes in the northern Great Plains during hibernation, the most stressful time of the year for temperate zone snake species. We did not find snake dens in this study, but would recommend that resource managers note and map any that are found on any park units.

Introduction

The herpetofauna of Wyoming, Nebraska, South Dakota, and North Dakota is poorly known. Baxter and Stone (1985) completed the last comprehensive summary of the herpetofauna of Wyoming. Lynch (1985) cataloged the herpetofauna of Nebraska; Ballinger et al. (2000) catalogued the herpetofauna of South Dakota, but neither author completed new surveys. Smith et al. (1998a, b) surveyed the herpetofauna of Wind Cave and Badlands National Parks, but these reports were not published. Wheeler and Wheeler (1966) last summarized the herpetofauna of North Dakota.

In the summers of 2002 and 2003, surveys were conducted at seven national park units including Scotts Bluff National Monument outside of Scotts Bluff, Nebraska; Fort Laramie National Historical Site near Fort Laramie, Wyoming; Jewel Cave National Monument, Devil's Tower National Monument, and Mount Rushmore National Memorial in the Black Hills of South Dakota and Wyoming; and Fort Union and Knife River Indian Villages National Historical Sites in western North Dakota. The objectives were to observe at least 90% of the species expected on each park unit and to comment on the effectiveness of survey techniques used on each park. We were asked to make management recommendations for each park unit as appropriate.

Methods

Several methods were used on each park unit, including visual encounter surveys (Crump and Scott, 1994), nighttime call surveys (Mossman et al., 1998), and night driving (Shaffer and Juterbock, 1994). Other techniques were specially designed for this study, including night walking and nighttime prairie dog town surveys (Kolbe et al., 2002). Because the objective of the study was to observe species expected on each park unit, techniques used to identify specific species, such as nighttime prairie dog surveys, were discontinued on each park unit after target

species were observed. Also, surveys were not randomly conducted, again because the surveys were designed to observe specific target species. Likely habitat was searched for all types of herpetofauna expected on each park unit. The fieldwork during 2002 was seriously compromised by extreme drought conditions that existed throughout the area; most wetland sites on the park units never filled with water and amphibians were probably underrepresented in the samples. During 2003, the drought eased somewhat, but the area was still in a moderate to severe drought, and much of the ground was so dry that rain soaked into the ground rapidly and wetlands did not fill.

Visual encounter surveys: Visual encounter surveys were completed for two person-hours per site in suitable habitat on all park units during the day and during suitable weather conditions (temperature > 16^{o}C, wind calm to moderate). Due to limited field time, visual encounter surveys were sometimes conducted in less than ideal circumstances. No effort was made to determine the amount of area searched, since this varied widely due to habitat, searching technique, target species, and observer effort. Several surveys were abandoned at Scotts Bluff National Monument and Fort Laramie National Historical Site in 2002 due to high winds. In 2003, some surveys were abandoned due to dangerous lightning storms.

Nighttime call surveys: Nighttime call surveys were completed at several wetland sites of many different sizes, including riverine sites, at all park units. However, most wetlands never filled with water, and typically the field crews conducted surveys at dry sites that would be wetlands during wetter years. At times, the field crews chose random areas along roads to conduct surveys, especially along irrigation canals and rivers, because of the drought conditions that prevailed in 2002 and 2003. Surveys were completed for 15 minutes three times apiece at each site across all parks and calling amphibians were recorded.

Night driving and night walking: Because most of the park units were so small, night driving could not be usefully conducted at most sites. However, entrance roads were searched at night during nighttime call survey work, and crews walked trails using flashlights to searching for herpetofauna. Search time was highly variable, and it is not possible to judge how much habitat was surveyed using these types of surveys, since it is not known how much habitat is effectively searched by cars or workers driving or walking trails at night. Because the roads and trails were frequently little more than access roads or short walking loops, we did not estimate the road or trail mileage searched.

Nighttime prairie dog town surveys: Kolbe et al. (2002) discovered that it was possible to search prairie dog towns and successfully observe tiger salamanders (*Ambystoma tigrinum*) at night by shining flashlights into prairie dog burrows. On average, about two salamanders are discovered per 100 burrows searched, making the technique very effective in finding these highly cryptic burrowing salamanders, even if a careful count of a population cannot be made (Kolbe et al., 2002). Prairie dog town surveys were conducted until at least 100 prairie dog holes had been searched, or one tiger salamander was observed. Prairie dog town surveys were used on park units until at least one tiger salamander was discovered, at which time this survey type was discontinued on each park. On parks without prairie dog towns, small mammal burrows and other types of burrows were searched for tiger salamanders at night, but this proved ineffective.

Results

Species expected and observed on each park unit are listed in Tables 1 and 2. Species expected on each park were largely determined from range maps published in Conant and Collins (1991).

It is difficult to compare each survey type, since each type is designed to find certain target species of varying observability. A total of 206 hours of visual encounter surveys were conducted on all park units combined in 2002. On these surveys, 29 specimens were collected, a success rate of 0.141 specimen/hour. In 2003, 178 hours of visual encounter surveys were conducted, with 80 specimens collected, for a success rate of 0.449 specimen/hour.

Twelve prairie dog town surveys were conducted in 2002, with four *Ambystoma tigrinum* found on three surveys. Five prairie dog town surveys were conducted in 2003, with one *Bufo woodhousii* and one *Pseudacris triseriata* found during one of these surveys. Hundreds of burrows were checked on all these surveys, but it might be more accurate to define the "success rate" as the number of surveys during which specimens of any number or species were found; in this case, 25% of the surveys were successful in 2002. In 2003, the success rate was 20%. Usually it took from 15 – 30 minutes to conduct a survey of a prairie dog town.

Nighttime calling surveys were highly successful in finding anurans. One hundred sixty-three call surveys were conducted in 2002, or 40.75 hours of surveys. In 2003, 51 call surveys were conducted, or 12.75 hours of surveys. Choruses were found during 78 of the 2002 surveys, for a success rate of 47.9%. In 2003, choruses were found during 25 surveys, for a success rate of 49.0%. However, anurans were not equally likely to be found during these surveys. Primarily *Pseudacris triseriata* and *Bufo woodhousii* were found on nighttime calling surveys, along with an occasional chorus of *Rana pipiens*. Various other anurans expected on the park units, such as *B. cognatus* and *Spea bombifrons*, were not found during these surveys.

Discussion

Our work showed that the first objective of the study, observing at least 90% of the herpetofauna on each park unit, was not met. According to Tables 1 and 2, 43.8% of the species

expected on Devil's Tower National Monument were observed; for Fort Laramie National Historical Site, 64.3% of the expected species were observed; for Fort Union National Historical Site, 27.3% of the expected species were observed; for Jewel Cave National Monument, 36.4% of the expected species were observed; at Knife River Indian Villages National Historical Site, the investigators found 38.5% of the expected species; at Mount Rushmore National Memorial, 36.4% of the expected species were observed; and at Scotts Bluff National Monument, the investigators found 50.0% of the expected species. To sum up, from 27.3 – 64.3% of the species we expected to find at each site were found. However, these raw data may be misleading, for at least two reasons; 1) The park units in this study are small and not representative of the landscapes in which they exist (i.e., not all habitat types found within the surrounding landscapes are represented in each park unit); and 2) Many of these small park units are surrounded by unsuitable habitat rendering immigration of species into the park unlikely. We discuss each of these factors in more detail below. In addition, field time was too limited to find rare species, especially snakes but also other species such as Plains spadefoots (*Spea bombifrons*) and Great Plains toads (*Bufo cognatus*);

Park units in this study are small pieces of a larger landscape. If the species occurs within the region, it may not occur on a small park unit, because small units do not represent the larger landscape. For example, not all habitat types within a region occur within one small subsection of it, and as the study site (i.e., park unit) becomes smaller, it is more likely that the unit will contain fewer of the possible habitat types found within the region. For example, prairie rattlesnakes (*Crotalus viridis*) may not be found on a park within the range of the species if that park does not contain appropriate habitat (such as rocky features, especially suitable for den sites), even if the prairie rattlesnake is common in the surrounding area. Another example is the

painted turtle, *Chrysemys picta*, which requires larger, fairly well developed ponds, and these do not exist on many of the park units studied in this project. Painted turtles were not found at any park unit we visited, although they were common throughout the region. Most likely this is because larger ponds were not found on any park units we studied, rather than any other fault of the study design.

Another reason several of the park units investigated in this study may have lacked species we expected to find is that the park units were small and were surrounded by unsuitable habitat, such as farmland or urban areas. Such habitat can disrupt normal migration patterns of wildlife, and some species expected within the landscape might not be able to migrate to all suitable habitat within the landscape. We noticed suitable habitat for various species within each park unit but did not find the expected species in some cases. We suspected that this was because populations once found within park units had died out within the park unit and had not been replaced by migrants from the surrounding area, since the surrounding area was unsuitable for the species in question.

Finally, we believe that many uncommon species were not documented due to the length of our visits to any park unit. Resources demanded that only a few days were spent on each unit, and it is of interest that, despite the fact that the success of visual encounter surveys in 2003 was triple the success in 2002, only two species were documented in 2003 that were not documented in 2002, and these were found on only a few parks. Most likely, we found only the common species present on any given park unit each field season. Various uncommon species may not be found for months or even years, especially explosive breeding amphibians such as Great Plains toads (*Bufo cognatus*) and Plains spadefoots (*Spea bombifrons*), or rare snakes such as pale milk snakes (*Lampropeltis triangulum multistriata*) and western hognose snakes (*Heterodon nasicus*).

For uncommon species, considerably more work is necessary. Intensive work over a full field season is needed at each park unit, possibly as part of a technician's job on the park unit. For example, a technician on the park for other duties could add drift fences and herpetological searches as part of their job. In particular, drift fences would be a useful strategy as they have been shown to be the most effective means of sampling several herpetofauna, especially snakes (Brenner et al., 1992). However, drift fences must be checked daily, so a technician must be on site for the field season to perform this function. Rare species can also be documented if they are found by park personnel knowledgable in herpetofaunal identification or are brought alive to such personnel. Although park personnel frequently reported herpetofaunal sightings, it was not possible to use all these sightings in this report because identification of the specimens was sometimes in doubt. Ultimately, it is unlikely that a field crew that spends only a few days in the field at various times during the active season will find much but common species of herpetofauna. It is critical to remember that herpetofauna are by nature very secretive, and only the common species are easily spotted.

A few comments can be made about survey techniques. Drift fences should be incorporated into the study design, as this type of trap can uncover various rare and secretive species of herpetofauna. However, they are costly, time consuming to install, and must be checked daily. Therefore, it was not practical to install them in this study.

In the absence of drift fences, the visual encounter survey is the only survey type that can be used to find various rare herpetofauna, especially snakes, but also other herpetofauna that may have specific habitat requirements. Given our success rates they do not seem very successful, but the visual encounter survey has been used for years to find herpetofauna across the world, and when timed can be used with some scientific rigor. We believe our increased success in

2003, nearly triple that of 2002, is probably due to slightly heavier rain in 2003. In the northern Great Plains, aridity is particularly problematic, and visual encounter surveys are not only more successful in rainier seasons, but also when suitable habitat is searched (such as near water sources or in canyons), rather than randomly chosen sites. We believe that we were more successful in encountering herpetofauna on this study than Smith et al. (1998a) at Wind Cave National Park because they conducted surveys at random sites. We suggest that, where resources are limiting, visual encounter surveys be conducted only in suitable habitat.

Nighttime call surveys, while they have been highly successful in recording calling choruses of anurans, generally record the same species every time. Most such surveys have located one species, *Pseudacris triseriata*, with *Bufo woodhousii* commonly recorded in suitable habitat (along rivers and smaller streams). *Rana pipiens* were also occasionally recorded. Nighttime call surveys can be used to monitor these species. It is likely that *R. pipiens* is the most important of these, since their habitat requirements seem to be more stringent and there is considerable evidence that their populations are in decline in many parts of their range (Smith, 2003). Other species of interest, such as *B. cognatus* and *Spea bombifrons*, are explosive breeding anurans that may breed only a few nights a year (Conant and Collins, 1991). For these anurans, investigators must be in the right place at the right time; typically small ponds along roadsides or on the prairie during heavy spring rains (Smith et al., 1998a). These environmental conditions did not occur while field crews were on park units during 2002 or 2003.

Night driving and night walking were not successful, probably because few roads or trails exist on these parks, although the senior author has frequently used night driving to collect herpetofauna with great success in many habitat types. In this study, investigators observed

roads and trails carefully as they entered and left park units, but only a few kilometers of roads or trails existed on each unit, and no specimens were found on these surveys.

Surveys of prairie dog towns are highly directed searches used to discover *Ambystoma tigrinum*, although they may find other herpetofauna, such as *B. woodhousii* or *Crotalus viridis*. Since they take little time to conduct (from 15 – 30 minutes) and are usually successful within a short time in finding the relatively cryptic *A. tigrinum*, they are a worthwhile addition to any general herpetofaunal study in the Great Plains region. However, their limitations should be considered.

Finally, this interim report would not be complete without mentioning general weather conditions during 2002 and 2003. The region of the study is subject to periodic drought, and during 2002 experienced severe drought with drought severity only slightly lessened in 2003. In addition, the soil had become so dry by 2003 that the slightly increased rainfall in 2003 mostly soaked into the dry soil and did not form wetlands. Therefore, most wetlands did not fill with water during 2002 or 2003. Although surveys of wetlands were conducted, such as visual encounter surveys and nighttime calling surveys, since the wetlands did not hold water we can only assume that these surveys were highly ineffective in both years. High winds also plagued the area, and in 2002 several surveys were conducted at Fort Laramie National Historical Site and Scotts Bluff National Monument during wind conditions that were not suitable for herpetofaunal activity. Winds over 100 km/hr were common during some spring field trips to these sites in 2002.

Management considerations: Water is a critical resource for amphibians and reptiles throughout the region. On some parks, resource managers dam water for wildlife and livestock using various methods. Some of these methods, such as concrete tanks or above ground stock

tanks commonly used on ranches, are ineffective at creating wetlands that amphibians and reptiles can utilize. However, simple earthen dams or dams made of felled logs can be very effective at creating habitat suitable for amphibians and reptiles. In addition, ponds can be unsuitable for amphibians and reptiles if they are commonly accessed by herds of large ungulates. Especially problematic on many federally managed lands in the region are cattle and horses, which may trample vegetation and foul the water in ponds. Parts of ponds used to water livestock should be fenced to reduce habitat destruction by managed herds on some parks. Partial fencing keeps part of the pond suitable for amphibians and reptiles while allowing access to some of the pond for drinking water for livestock. We do not think these problems exist in the case of native ungulates.

Managers should keep in mind that amphibians and reptiles thrive in smaller ponds (ca. 1 ha or less) that lack introduced predatory fish and have substantial vegetative cover, such as reeds and cattails. The senior author's experience in the region indicates that the ponds themselves are a critical and rare resource, and that, when present, they are frequently unsuitable for amphibians because the public (and sometimes managers) deliberately or accidentally introduce predatory fish into the ponds. Management of park guests can be as important as creating the ponds.

Resource managers should also keep records of snake sightings, especially in the spring or fall. Where concentrations of snakes are encountered, snake dens could exist. These should be carefully assayed for snake activity, particularly by a professional herpetologist. Den sites are a critical resource during winter, the most stressful time for snakes of the temperate zone. Snake populations at den sites can be particularly large. The den sites should be left alone for many reasons, including the need to provide critical habitat for snake populations but also to manage park visitation. Snakes will continue to visit these sites even if the sites are destroyed, and park

visitors will commonly encounter snakes in these areas, especially in spring and fall. Prudent reptile management and visitor safety on parks both require that such sites be identified and possibly isolated. We did not find den sites on any park units, although some probably exist.

Summary

In summary, the surveys were reasonably successful given the weather conditions, and we discovered a reasonable number of species expected at the sites. However, lack of resources and poor weather hampered the study. Adding a natural historian generally familiar with reptiles and amphibians could help manage each park unit if this person could identify rare species not observed during this study but occasionally found on the parks. Improving wetland resources on most of these park units will probably increase the number of amphibians and reptiles that exist on the park units. We recommend that park personnel become familiar with identification, especially of rare species of herpetofauna. We also recommend monitoring of some species of amphibians, especially northern leopard frogs (*Rana pipiens*), which can be rare and require larger, more pristine, ponds. Finally, we recommend identification of snake den sites to manage snake populations and for the safety of park visitors.

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Park Unit	Amti		Buco		Buwo		Pstr		Raca		Rapi		Spbo		Apsp		Chpi		Chse		Cnse		Eumu		Homa		Phdo		Scgr		Scun	
	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O
DETO	**Y**	**Y**	**Y**	N	**Y**	**Y**	**Y**	**Y**	N	N	**Y**	**Y**	**Y**	N	**Y**	N	**Y**	N	**Y**	N	N	N	N	N	N	N	**Y**	N	N	N	N	N
FOLA	**Y**	N	?	N	**Y**	**Y**	**Y**	**Y**	?	N	**Y**	**Y**	**Y**	N	?	N	**Y**	**Y**	**Y**	**Y**	N	N	N	N	?	N	**Y**	N	?	N	?	N
FOUS	**Y**	N	?	N	?	**Y**	**Y**	**Y**	N	N	**Y**	**Y**	**Y**	N	?	N	**Y**	N	**Y**	N	N	N	N	N	N	N	?	N	?	N	N	N
JECA	**Y**	**Y**	N	N	**Y**	**Y**	**Y**	**Y**	N	N	**Y**	N	**Y**	N	N	N	**Y**	N	**Y**	N	N	N	N	N	N	N	?	N	N	N	N	N
KNRI	**Y**	N	**Y**	N	**Y**	**Y**	**Y**	**Y**	N	N	**Y**	**Y**	**Y**	N	N	N	**Y**	N	**Y**	N	N	N	N	N	N	N	N	N	N	N	N	N
MORU	**Y**	N	N	N	**Y**	N	**Y**	**Y**	N	N	**Y**	**Y**	**Y**	N	N	N	**Y**	N	**Y**	N	N	N	N	N	N	N	?	N	N	N	N	N
SCBL	**Y**	**Y**	**Y**	N	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	N	**Y**	**Y**	**Y**	N	**Y**	N	**Y**	N	**Y**	N	**Y**	N	**Y**	N	?	N	?	N

Table 1. Amphibians, turtles, and lizards expected (E) or observed (O) on the park units studied in this report. Abbreviations: Y = yes; N = no; ? = insufficient data. DETO = Devil's Tower National Monument. FOLA = Fort Laramie National Historical Site. FOUS = Fort Union National Historical Site. JECA = Jewel Cave National Monument. KNRI = Knife River National Historical Site. MORU = Mount Rushmore National Memorial. SCBL = Scott's Bluff National Monument. Amti = *Ambystoma tigrinum*; Buco = *Bufo cognatus*; Buwo = *Bufo woodhousei*; Pstr = *Pseudacris triseriata*; Raca = *Rana catesbeiana*; Rapi = *Rana pipiens*; Spbo = *Spea bombifrons*; Apsp = *Apalone spinifera*; Chpi = *Chrysemys picta*; Chse = *Chelydra serpentina*; Cnse = *Cnemidophorus sexlineatus*; Eumu = *Eumeces multivirgatus*; Homa = *Holbrookia maculata*; Phdo = *Phrynosoma*; Scgr = *Sceloporus graciosus*; Scun = *Sceloporus undulata*.

Park Unit	Coco		Crvi		Hena		Latr		Opve		Pica		Stoc		Thel		Thra		Thsi	
	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O
DETO	**Y**	**Y**	**Y**	N	**Y**	N	**Y**	N	N	N	**Y**	**Y**	N	N	?	N	?	N	**Y**	**Y**
FOLA	**Y**	**Y**	**Y**	**Y**	**Y**	N	**Y**	N	N	N	**Y**	**Y**	N	N	N	N	?	N	**Y**	**Y**
FOUS	**Y**	N	N	N	**Y**	N	N	N	?	N	**Y**	N	N	N	N	N	**Y**	**Y**	**Y**	N
JECA	?	N	N	N	N	N	**Y**	N	?	N	**Y**	N	?	N	**Y**	**Y**	N	N	**Y**	N
KNRI	**Y**	N	N	N	**Y**	N	N	N	N	N	**Y**	N	N	N	N	N	**Y**	**Y**	**Y**	**Y**
MORU	?	N	N	N	N	N	**Y**	N	?	N	**Y**	N	?	N	**Y**	**Y**	N	N	**Y**	**Y**
SCBL	**Y**	**Y**	**Y**	**Y**	**Y**	N	**Y**	N	N	N	**Y**	**Y**	N	N	N	N	**Y**	N	**Y**	**Y**

Table 2. Snakes expected (E) or observed (O) on the park units studied in this report. Abbreviations are as used in Table 1. Species: Coco = *Coluber constrictor*; Crvi = *Crotalus viridis*; Hena = *Heterodon nasicus*; Latr = *Lampropeltis triangulum*; Opve = *Opheodrys vernalis*; Pica = *Pituophis catenifer*; Stoc = *Storeria occipitomaculata*; Thel = *Thamnophis elegans*; Thra = *T. radix*; Thsi = *T. sirtalis*.